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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/734,543	12/12/2003	Jin Soo Kim	2013P139	9702

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EXAMINER

HOANG, QUOC DINH

ART UNIT PAPER NUMBER

2818

DATE MAILED: 09/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/734,543	Applicant(s) KIM ET AL.	
	Examiner Quoc D. Hoang	Art Unit 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 June 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Amendment filed on 06/27/2005 has been entered and made of record as Paper No. 0605. In Amendment, claims 8-11 are newly added. Claims 1-11 are pending in the application.

Applicants' remarks have been considered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mukai et al (U.S. Pat No. 6,815,242 hereafter "Mukai")

Regarding claim 1 Mukai teaches a method of forming quantum dots, the method comprising: forming an $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer 136 on a buffer layer 132/134 (col. 17, lines 15-55 and Fig. 19A-19C); and forming $\text{In}(\text{Ga})\text{As}$ quantum dots 138 on the $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer 136 (col. 17, lines 15-55 and Figs. 19A-19C).

Mukai teaches the claimed invention except for the strained layer, It would have been obvious to a person of ordinary skill in the art at the time of the invention was made to use the $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer 136 as a strained layer since it was known in the art that the $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer 136 could be used to control the lattice constant of the surface

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of the buffer layer, therefore the quantum dots can be shifted to a longer wavelength as taught by Mukai, column 3, line 35 through column 4, line 15).

Regarding claim 2, Mukai teaches wherein the buffer layer 132/134 is made of InAlAs, InAlGaAs, InP, InGaAsP or is a heterojunction layer of at least two of these four materials (col. 17, lines 28-32 and Fig. 19A).

Regarding claim 3, Mukai teaches wherein in the $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer 136, "x" is 0.05 - 0.45 (col. 17, line 32 and Fig. 19A).

Regarding claim 4, Mukai teaches wherein the thickness of the $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer 136 is 100nm, but do not teach the thickness of the $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer 136 in a range of 0.5 nm - 10 nm (col. 17, line 20 and Fig. 19A).

In re Woodruff, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and In re Aller, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious). It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to use the optimum ranges for the growth rate of the $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer 136 in the method of Mukai et al.

Regarding claim 7, Mukai teaches wherein the $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer and the In(Ga)As quantum dots can be stacked 1 to 30 sets on top of one another (see fig. 7).

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4. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mukai et al (U.S. Pat No. 6,815,242 hereafter "Mukai") in view of Petroff et al (U.S. Pat No. 5,614,435 hereafter "Petroff").

Mukai does not teach wherein In(Ga)As quantum dots are formed by metal organic chemical vapor deposition, molecular beam epitaxial, or chemical beam epitaxial.

Regarding claim 5, Petroff teaches wherein In(Ga)As quantum dots are formed by metal organic chemical vapor deposition, molecular beam epitaxial, or chemical beam epitaxial (col. 7, lines 50-65). At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to combine the MOCVD teaching of Petroff with Mukai's MOVPE, because it would have provided a better formation of quantum dots on the substrate as taught by Petroff, column 7, lines 50-65.

Regarding claim 6, Petroff teaches wherein the thickness of the InGaAs quantum dots 38 is 3-10 monolayers (col. 8, lines 60-40 and Fig. 6e).

5. Claims 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mukai et al (U.S. Pat No. 6,815,242 hereafter "Mukai") in view of Shields et al (U.S. Pat No. 6,885,023 hereafter "Shields").

Regarding claim 8, Mukai teaches a method of forming quantum dots, the method comprising: forming a buffer layer 132/134 on a GaAs substrate 130 (col. 17, lines 15-55 and Fig. 19A-19C); forming an $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer 136 on a buffer layer 132/134 (col. 17, lines 15-55 and Fig. 19A-19C); and forming In(Ga)As quantum dots 138 on the $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer 136 (col. 17, lines 15-55 and Figs. 19A-19C). Mukai

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teaches the claimed invention except for wherein the $\text{In}_x\text{Ga}_{1-x}\text{As}$ strained layer changes the surface structure of the lattice-matched buffer layer and alters a strain energy that is necessary to grow the $\text{In}(\text{Ga})\text{As}$ quantum dots. It would have been obvious to a person of ordinary skill in the art at the time of the invention was made to use the $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer 136 as a strained layer since it was known in the art that the $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer 136 could be used to control the lattice constant of the surface of the buffer layer, therefore the quantum dots can be shifted to a longer wavelength as taught by Mukai, column 3, line 35 through column 4, line 15).

Mukai teaches the GaAs substrate, but does not clearly teach the InP substrate

However, Shields teaches an InP substrate 33 is used (col. 15, lines 40-55 and Fig. 13). It would have been obvious to a person of ordinary skill in the art at the time of the invention was made to combine the InP substrate teaching of Shields with Mukai's device, because it would have provided a better matching between the substrate and an upper InAlAs buffer layer as taught by Shields, column 15, lines 40-55.

Regarding claim 9, Mukai teaches wherein the buffer layer 132/134 is made of InAlAs, InAlGaAs, InP, InGaAsP or is a heterojunction layer of at least two of these four materials (col. 17, lines 28-32 and Fig. 19A).

Regarding claim 10, Mukai teaches wherein in the $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer 136, "x" is 0.05 -0.45 (col. 17, line 32 and Fig. 19A).

Regarding claim 11, Mukai teaches wherein the thickness of the $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer 136 is 100nm, but do not teach the thickness of the $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer 136 in a range of 0.5 nm - 10 nm (col. 17, line 20 and Fig. 19A).

In re Woodruff, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and In re Aller, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious). It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to use the optimum ranges for the growth rate of the $\text{In}_x\text{Ga}_{1-x}\text{As}$ layer 136 in the method of Mukai et al.

Response to Arguments

6. Applicant's arguments filed 06/27/2005 have been fully considered but they are not persuasive.

In response to applicant's argument that the Mukai fails to teach or suggest that the InGaAs layer 136 is not formed on the buffer layer 132/134. The examiner disagrees. Clearly in column 17 lines 15-45 and figure 19B, the InGaAs layer 136 is formed on the buffer layer 132/134.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quoc Hoang whose telephone number is (571) 272-1780. The examiner can normally be reached on Monday-Friday from 8.00 AM to 5.00 PM.

If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on (571) 272-1787. The fax phone numbers of the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

dy
Quoc Hoang
Patent examiner/AU 2818


David Nelms
Supervisory Patent Examiner
Technology Center 2800